Clinical Medicine

Ethnic Differences in Mortality From Acute Rheumatic Fever and Chronic Rheumatic Heart Disease in New Mexico, 1958-1982

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To examine time trends and differences in mortality rates from acute rheumatic fever and chronic rheumatic heart disease in New Mexico's Hispanic, American Indian, and non-Hispanic white populations, we analyzed vital records data for 1958 through 1982. Age-adjusted mortality rates for acute rheumatic fever were low and showed no consistent temporal trends among the three ethnic groups over the study period. Age-adjusted and age-specific mortality rates for chronic rheumatic heart disease in Hispanic and non-Hispanic whites decreased over the 25-year period, although rates were higher among Hispanics than among non-Hispanics during most of the time period. In American Indians, age-adjusted mortality rates for chronic rheumatic heart disease increased between 1968 and 1977 to twice the non-Indian mortality rates during the same period. Despite this increase in mortality from chronic rheumatic heart disease among New Mexico's American Indians from 1968 to 1977, the New Mexico data generally reflect national trends of decreasing mortality from chronic rheumatic heart disease.

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Although acute rheumatic fever and chronic rheumatic heart disease were once major public health problems in the United States, dramatic decreases in their incidence and prevalence have taken place over the past 50 years.[1-4] The reasons for this national decline remain a matter of speculation,[1] but changes in host factors, alterations in the virulence of the streptococci, disappearance of a necessary cofactor in the production of disease, and an increasing use of antibiotic therapy for pharyngitis may have been responsible.[1,3,5] Socioeconomic factors and changing social conditions have also been considered important in the nationwide decline of acute rheumatic fever and chronic rheumatic heart disease.[1,6] Not all racial groups have experienced this decline to the same extent.[7-12] A higher incidence of acute rheumatic fever has been documented in blacks,[10,11] American Indians,[7] Hawaiians,[8] US Samoans,[8] and Hispanics[12]; these elevations in disease incidence have been attributed primarily to less favorable living conditions associated with lower economic status.

New Mexico has three major ethnic groups—Hispanics, American Indians, and non-Hispanic whites—each with unique social systems and health beliefs and with widely divergent socioeconomic characteristics. Of New Mexico's American Indians, 41% live below the poverty level—as do 23% of Hispanics—compared with only 10% of the state's non-Hispanic whites.[13] The Indian and Hispanic populations also have fewer years of formal education than do the non-Hispanic whites in the state.[13] Although strong ethnic differences have been observed for cancer incidence and mortality in New Mexico,[14,15] as well as for other diseases, ethnic differences in the epidemiology of acute rheumatic fever and chronic rheumatic heart disease have not been examined. The rationale for examining these diseases derives from the differing cultural characteristics of Hispanics, American Indians, and non-Hispanic whites as these characteristics may affect disease-specific morbidity and mortality rates.

In this report we describe the epidemiology of mortality from acute rheumatic fever and chronic rheumatic heart disease in New Mexico's three major ethnic groups, Hispanics, American Indians, and non-Hispanic whites. We have examined vital records for the period 1958 to 1982 to characterize time trends in mortality from these diseases and have calculated age-adjusted and age-specific mortality rates by sex and ethnic group for New Mexico's culturally diverse residents.

Subjects and Methods

We obtained coded death certificate data for New Mexico residents for the years 1958 to 1982 from the New Mexico Bureau of Vital Statistics. The cause of death on the certificates was coded according to the seventh revision of the International Classification of Diseases (ICD) for the years 1958 to 1968,[16] the eighth ICD revision for the years 1969 to 1978,[17] and the ninth ICD revision for the years 1979 to 1982.[18] Deaths attributed to acute rheumatic fever were

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coded as ICD 400 to 402.9 in the ICD seventh revision and as 390 to 392.9 in the eighth and ninth revisions. Deaths attributed to chronic rheumatic heart disease were coded as 410 to 416.9 in the seventh revision and as 393 to 398.9 in the eighth and ninth revisions.

The ethnicity of persons was assigned by the Bureau of Vital Statistics on the basis of information contained on the death certificates. Hispanic ethnicity was determined on the basis of the decedent's surname, the surnames of the decedent's parents, and specific statements on the death certificate. American Indians were identified solely on the basis of information cited on the death certificate. American Indian cases were primarily reported among the state's Navajo, Pueblo, Zuni, and Apache tribes. Non-Hispanic whites were coded as "white" on the death certificate and did not have a Spanish surname or other information to indicate that they were Hispanic. Because of a small number of cases, we did not examine mortality from acute rheumatic fever and chronic rheumatic heart disease among blacks or other ethnic or racial groups.

Denominators for rate calculations were derived from the censuses of 1960,[19-21] 1970,[22-24] and 1980 (Table 1).[13] Because different techniques were used by the US Census Bureau to identify ethnicity, we have adjusted the estimates of the Hispanic white population from 1960 to 1980 to account for the different enumeration procedures.[25] To clarify the comparability of the different techniques in determining ethnicity, we conducted a cross-sectional survey of Hispanics and non-Hispanics in New Mexico in which each of the ethnic identifiers from the censuses of 1960, 1970, and 1980 was included in a single questionnaire. The responses obtained in this survey provide rough guidelines of the comparability of the Hispanic data from the three censuses. We adjusted the estimates of the Hispanic populations from the 1960 and 1970 censuses on the basis of this survey.[25] Estimates of the American Indian population for 1960 were adjusted to account for systematic errors that occurred in data processing.[26]

Age-specific and age-adjusted mortality rates were calculated for the five-year periods, 1958-1962, 1963-1967, 1968-1972, 1973-1977, and 1978-1982. Age-adjusted rates were calculated by the direct method and standardized to the 1970 standard-million population of the United States. Age-specific and age-adjusted mortality rates were similarly calculated for the single years from 1958 to 1982 to assess temporal trends.

We used standard programs from the Statistical Analysis System[27] for our analyses.

Results

Age-adjusted mortality rates by time period for acute rheumatic fever and for chronic rheumatic heart disease are shown in Tables 2 and 3. In New Mexican male and female subjects, decreases in chronic rheumatic heart disease-related mortality rates were apparent in Hispanics and in non-Hispanic whites from 1958 to 1982, with the most dramatic decreases observed among Hispanic women. An increase in chronic rheumatic heart disease-related mortality was observed in American Indian men and women from 1968 to 1977. During this ten-year period, mortality rates for American Indians were double the rates for non-Indians. Age-adjusted mortality rates for acute rheumatic fever were low and showed no consistent trends between the sexes and among the various ethnic groups (Table 2).

Age-specific mortality rates for chronic rheumatic heart disease generally decreased among Hispanics and non-Hispanic whites in each age group during the study period (Figures 1 through 4); between 1968 and 1977, however, American Indians showed age-specific increases in many age groups (Table 4). These increases were greatest among American Indian men aged 55 to 74 years and among American Indian women aged 65 to 74 years (Table 4).

TABLE 1.—*Population Estimates for New Mexico Residents, 1960, 1970, and 1980**

Ethnic Group	*1960*	*1970*	*1980*
Hispanic			
Male	166,652	192,967	233,315
Female	173,805	197,721	238,677
American Indian			
Male	27,586	35,035	51,032
Female	28,669	37,753	55,087
Non-Hispanic white			
Male	275,700	259,153	341,328
Female	259,606	265,974	350,733

*Based on United States Census Bureau figures.

TABLE 2.—*Age-Adjusted* Annual Mortality Rates From Acute Rheumatic Fever in New Mexico, 1958-1982 (per 100,000)*

	5-Year Time Period				
Ethnic Group by Sex	*1958-1962*	*1963-1967*	*1968-1972*	*1973-1977*	*1978-1982*
Male					
Non-Hispanic white, n=24†	0.3	0.2	0.5	0.3	0.2
Hispanic, n=13	0.2	0.1	0.1	0.6	0.4
American Indian, n=5	0.6	1.0	0.0	1.3	0.2
US whites‡	0.4	0.3	0.1	0.1	0.05
Female					
Non-Hispanic white, n=39	0.4	0.1	0.4	0.6	0.7
Hispanic, n=22	0.4	0.3	0.4	0.4	1.0
American Indian, n=5	1.9	0.4	0.9	0.0	0.7
US whites‡	0.4	0.2	0.1	0.04	0.03

*Adjusted to 1970 United States population.
†Number of deaths during 25-year period.
‡Rates calculated for mid-point of each 5-year interval.

TABLE 3.—*Age-Adjusted* Annual Mortality Rates From Chronic Rheumatic Heart Disease in New Mexico, 1958-1982 (per 100,000)*

	5-Year Time Period				
Ethnic Group by Sex	*1958-1962*	*1963-1967*	*1968-1972*	*1973-1977*	*1978-1982*
Male					
Non-Hispanic white, n=407†	10.5	7.1	7.2	4.5	3.0
Hispanic, n=230	9.7	9.9	5.6	6.5	3.6
American Indian, n=55	10.2	6.3	14.9	10.0	1.4
US whites‡	10.1	7.4	7.4	5.8	2.5
Female					
Non-Hispanic white, n=477	10.6	8.5	5.7	4.0	3.2
Hispanic, n=296	16.4	11.3	7.2	4.4	3.4
American Indian, n=52	6.6	7.8	10.6	8.5	4.7
US whites‡	10.3	9.8	7.1	5.8	3.7

*Adjusted to 1970 United States population.
†Number of deaths during 25-year period.
‡Rates calculated for mid-point of each 5-year interval.

Discussion

The dramatic decrease in the incidence of acute rheumatic fever in various communities in the United States has been well described. Since 1940 when an estimated 250,000 new cases occurred,[1] acute rheumatic fever has become a rare disease. During the 1960s, high rates of acute rheumatic fever occurred in Baltimore,[11] Nashville,[10] and New York City.[12] During the subsequent decades, incidence rates for acute rheumatic fever declined in Baltimore,[1,28] with comparably low rates reported from Memphis, Tennessee[29]; Rhode Island[30]; Fairfax County, Virginia[31]; and suburban Los Angeles.[32] Population-based surveys in Rochester, Minnesota, show that incidence rates of acute rheumatic fever decreased annually from 13.6 per 100,000 population in 1935 to 1949 to 2.7 per 100,000 population in 1965 to 1978.[2] Thus, despite recent reports of isolated epidemics of acute rheumatic fever,[33-37] most national data clearly indicate falling trends in disease incidence.

Nationwide declines in mortality rates for acute rheumatic fever and for chronic rheumatic heart disease have paralleled their declining incidence.[4] From 1919 to 1961, the national mortality rate for acute rheumatic fever fell from 3.0 per 100,000 population to 0.4 per 100,000 population,[38] and current mortality rates for acute rheumatic fever approximate 0.1 per 100,000 population.[4] The nationwide mortality rate for chronic rheumatic heart disease fell from 20.2 per 100,000 population in 1939 to 2.2 per 100,000 population in 1982 (Table 3).[2] In New Mexico, mortality rates for acute rheumatic fever and chronic rheumatic heart disease have been declining since the 1930s. New Mexico's mortality rate for chronic rheumatic heart disease has remained slightly below national rates since the 1930s,[38] but the annual mortality rate for acute rheumatic fever in New Mexico has exceeded the national rate in certain years.

The few published studies that have examined racial or ethnic effects on the occurrence of acute rheumatic fever have documented substantial racial differences.[3,7-12,27,39] Among school children aged 5 to 9 years in Baltimore, black children had a rate of acute rheumatic fever nearly three times that of white children during the years 1960 to 1964,[11] and a rate nearly twice that of whites for children aged 5 to 14 years during a survey carried out in 1968.[28] Comparable racial differences were noted in Nashville from 1963 to 1969.[10] In Manhattan, Puerto Rican children aged 5 to 14 years had incidence rates of acute rheumatic fever from 1963 to 1965 that were triple the rates for inner-city white children

TABLE 4.—*Age-Specific Mortality Rates From Chronic Rheumatic Heart Disease in American Indians in New Mexico, 1958-1982 (per 100,000)*

Age Group, yr	Sex	5-Year Time Period 1958-1962	1963-1967	1968-1972	1973-1977	1978-1982
35-44	♂	0.0	12.3	30.3	5.3	0.0
	♀	0.0	5.2	5.1	0.0	3.7
45-54	♂	20.2	0.0	8.7	15.3	0.0
	♀	19.7	15.4	38.2	19.9	10.8
55-64	♂	14.1	12.2	35.6	21.1	9.3
	♀	14.0	22.0	10.8	38.1	16.2
65-74	♂	41.7	17.4	68.1	60.0	0.0
	♀	0.0	34.5	52.4	44.7	11.6
75+	♂	37.3	30.3	29.7	0.0	0.0
	♀	0.0	0.0	0.0	0.0	0.0

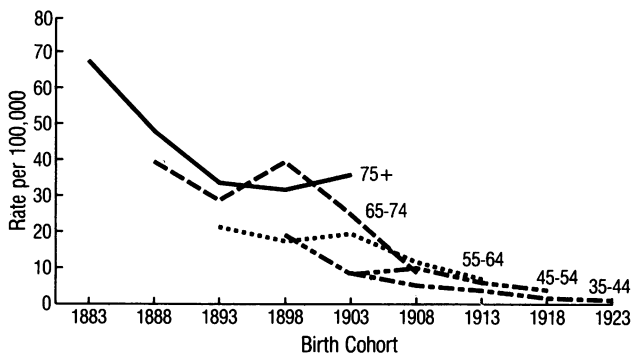

Figure 1.—The graph shows the chronic rheumatic heart disease mortality in *non-Hispanic* white men by age group and birth cohort (rates per 100,000).

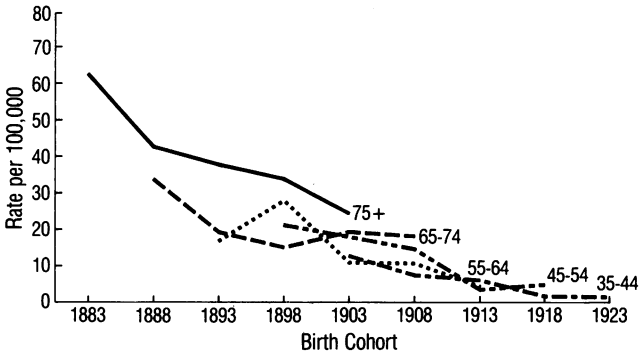

Figure 2.—The graph shows the chronic rheumatic heart disease mortality in non-Hispanic white women by age group and birth cohort (rates per 100,000).

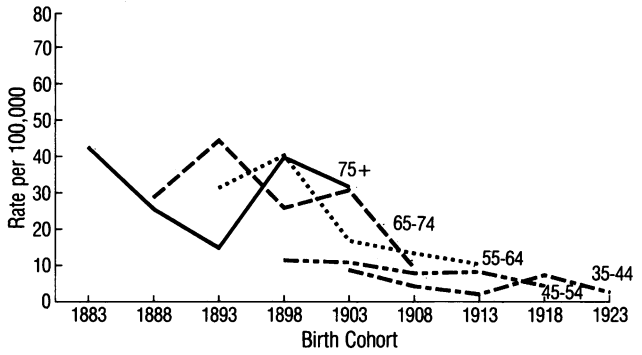

Figure 3.—The graph shows the chronic rheumatic heart disease mortality in Hispanic men by age group and birth cohort (rates per 100,000).

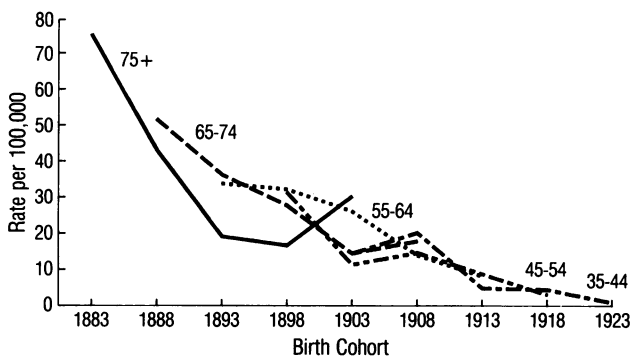

Figure 4.—The graph shows the chronic rheumatic heart disease mortality in Hispanic women by age group and birth cohort (rates per 100,000).

of similar age (78 per 100,000 versus 23 per 100,000).[12] Samoan children in Hawaii had high rates of acute rheumatic fever in a 1976 to 1980 survey (96.5 cases per 100,000) when compared with native Hawaiians (27.2 per 100,000), whites (9.0 per 100,000), and Japanese (0 cases per 100,000).[8] The incidence rate of acute rheumatic fever for Navajo children, aged 5 to 14 years, during the period 1962 through 1977 was 18.8 per 100,000.[7] Hispanic and black children in a Los Angeles suburb had a rate of hospital admissions for acute rheumatic fever five times higher than that for non-Hispanic whites, although the overall rate in the San Fernando Valley study area was low (0.21 per 100,000 population).[32] Hispanic school children in Denver also had rates of rheumatic heart disease and histories of acute rheumatic fever that exceeded non-Hispanic white rates.[40] In New Mexico, however, we observed no consistent excesses in age-adjusted mortality rates from acute rheumatic fever in Hispanics or American Indians when compared with rates for non-Hispanic whites (Table 2).

Among Hispanics and non-Hispanic whites, our data show clear trends, in parallel with national trends, toward decreasing mortality rates from chronic rheumatic heart disease (Table 3). This decrease may reflect improvements in diagnosis, improved access to medical care, an increased awareness of the importance of treating streptococcal pharyngitis, an increasing number of persons undergoing heart valve replacements, and a growing recognition of the need for antibiotic prophylaxis in patients with chronic rheumatic heart disease.[1,3,5,6,41] Changing host susceptibility and changes in the etiologic agent, the *Streptococcus,* have also been postulated as important factors in the decline in incidence and mortality from streptococcal disease.[1,5]

American Indians in New Mexico are the least economically advantaged group in the state. In other studies, lower economic status has been associated with higher mortality rates for acute rheumatic fever and chronic rheumatic heart disease[38,39]; no consistent patterns emerge, however, from a comparison of New Mexico's acute rheumatic fever mortality rates for American Indians with those of the other ethnic groups over all time periods. Nonetheless, age-adjusted mortality rates for chronic rheumatic heart disease in American Indians were double those rates in non-Indians for 1968 to 1977 and were notably elevated in older American Indians. The biggest decrease in mortality from acute rheumatic fever and chronic rheumatic heart disease in this ethnic group occurred in the most recent time period, 1978 to 1982. Although no published data explain this recent decline for all of New Mexico's American Indians, the increasing use of antibiotic prophylaxis for streptococcal infections among Navajo patients with rheumatic heart disease may have contributed to the decline in mortality rates.[12]

Our study has limitations that must be considered. Detecting all cases of acute rheumatic fever and chronic rheumatic heart disease is difficult because the diagnoses are based on clinical criteria, and it is probable that only cases under medical care were recorded on the death certificate as having died of these causes. The validity of death certificate cause-of-death statements for numerous diseases has been well described[42-44] and need not be discussed in detail here. In New Mexico, however, additional bias in death certificate-based studies may be related to ethnic group: a larger proportion of death certificates was coded into the category "symptoms, senility, and ill-defined conditions" for American Indians than for Hispanics and non-Hispanic whites.[15] Thus, misclassification of acute rheumatic fever- and chronic rheumatic heart disease-related deaths may be greater among American Indians than among non-Indians. Our rate calculations based on ethnic identification may also be subject to bias. For Hispanics in New Mexico, however, we found a high level of concordance (greater than 96%) between self-reported Hispanic ethnicity among subjects who participated in a statewide case-control lung cancer study conducted from 1980 through 1982[45] and the code assigned by the Bureau of Vital Statistics to deceased subjects.[25] This observation suggests that a misclassification of Hispanics was not a major source of bias in the study. Although we have not carried out comparable validation studies of American Indians in this state, determining the ethnicity of American Indians in New Mexico is less problematic than determining Hispanic ethnicity. Changes in coding schemes beginning in the eighth revision of the International Classification of Diseases resulted in a larger number of cardiac deaths classified as rheumatic in etiology; this change in coding could add additional bias to our results.[46] In addition, census undercounts of American Indians and instability of mortality rates due to a small number of deaths from acute rheumatic fever and chronic rheumatic heart disease limit our ability to detect trends and ethnic differences in mortality.

Despite the limitations of our study, we have shown changing patterns of mortality from acute rheumatic fever and chronic rheumatic heart disease in New Mexico from 1958 to 1982. We have also shown that ethnicity influenced chronic rheumatic heart disease mortality risk in this state. Although American Indians showed much higher mortality rates for chronic rheumatic heart disease than did non-Indians from 1968 to 1977, the overall trends of decreasing rheumatic heart disease mortality in New Mexico were similar to national trends from the late 1950s through the early 1980s.

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Precautions on Rifampin

PLEASE TELL PATIENTS receiving rifampin a few things: First, if a patient is pregnant, tell her to not take it, because there is concern about it being a teratogenic agent. Second, if a woman is on birth control pills, tell her that rifampin inactivates the effect of birth control pills. Third, if patients wear contact lenses, tell them that rifampin is excreted in the tears, and it will stain their contact lenses. And, fourth, my favorite, tell them that it will turn their urine orange—and I mean really orange.

—CHARLES SHABINO, MD

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